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Case Report

# CBCT-A Promising Diagnostic Tool for Radix Entomolaris

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## Abstract

Presence of an additional supernumerary distolingual root in the mandibular molar is termed as Radix Entomolaris (RE). It is common in mandibular first molar, but its occurrence in mandibular second molar is scarcely reported in literature. Two-dimensional imaging can diagnose anatomical root canal variations when taken with different horizontal angulations. With the recent innovations in three-dimensional diagnostic imaging, cone beam computed tomography (CBCT) can aid in unfolding the complexities of the root canal system. Accurate diagnosis by CBCT leads to the success of endodontic treatment. A rare case of radix entomolaris in mandibular second molar is reported here with three-dimensional imaging with CBCT.

***Keywords:*** *Cone Beam Computed Tomography; Additional Root; Mandibular Second Molar; Radix Entomolaris; Distolingual Root; Radix*

## Introduction

Variations of root canal anatomy may involve extra roots, fins, webs and isthmus that can make root canal treatment complicated and may lead to its failure. The prospects of a successful endodontic outcome increase with the knowledge of root canal anatomy. Multiple anatomic variations like the presence of extra canal or canals, C shaped canal configuration, dens in dente and abnormal morphology of the tooth and root can occur. The presence of a distolingual supernumerary extra root is called as Radix Entomolaris (RE). It is the one of the most common variations of the mandibular first molar with the presence of a distolingual root, first discovered by Carabelli in the year 1844 and termed by Bolk in 1915 [1,2]. RE is common in the mandibular first molar but its occurrence in mandibular second molar is least frequently reported in literature. According to Manning, only 2% of mandibular second molars have three roots [3]. The present study reports the diagnosis of an unusual case of RE in mandibular second molar with three roots and four canals, with the help of cone beam computed tomography (CBCT).

## Case Report

A 56-year-old female patient came with the complaint of pain in the lower left posterior tooth since one week. Clinical examination revealed that the mandibular left second molar was restored (tooth #37). The tooth was tender on percussion. A provisional diagnosis of acute irreversible pulpitis with apical periodontitis was made and the patient was sent for radiographic investigation.

The intraoral periapical radiograph showed a radio-opaque restoration in proximity to the pulp with widening of the periodontal ligament space and shadow of an additional root between the

mesial and distal roots (Figure 1). The presence of additional root was suggestive of radix entomolaris (RE) which was confirmed by CBCT.

***Figure 1:*** *Intraoral periapical radiograph shows an extra root in mandibular left second molar.*

CBCT of left mandibular posterior region was performed after obtaining informed consent with Kodak 9500 (tube voltage: 90 kV, current: 10 mA, Carestream health Inc., Rochester, NY, USA). The transverse, axial and sagittal CBCT sections of the involved tooth were taken. The CBCT scan slices confirmed the presence of radix entomolaris. All images were analyzed with the help of CS three-dimensional (3D) imaging software (Carestream Dental LLC). Axial images were obtained at 180 µm thickness and were studied at cervical, middle, and apical third of the roots to determine the canal morphology (Figure 2). The images revealed that the left mandibular second molar had three roots and four root canals (mesiobuccal, mesiolingual, distobuccal and distolingual). The accessory distal root was present centrally and lingually in between the mesial and distal roots in relation to 37. The distolingual root was slightly curved in the cervical area and curved buccally at the apex. CBCT examination helped in thorough understanding of the anatomy of the root and canals of the mandibular second molar.

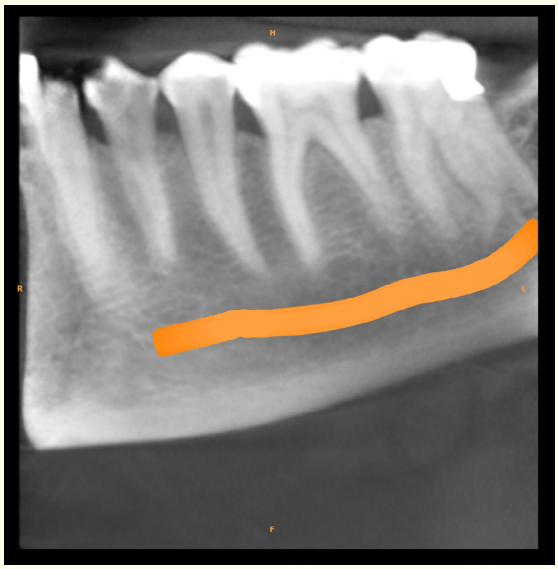

***Figure 2:*** *Sagittal CBCT slice shows the presence radix entomolaris.*

## Discussion

Radix entomolaris is referred to an additional root, present disto-lingually mainly in mandibular first molars. Presence of an additional root on the mesio-buccal aspect may occur rarely and is described as Radix Paramolaris (RP) [4]. Radix entomolaris and radix paramolaris can be found on the first, second and third mandibular molar, but its presence has been reported with least frequency in the second molar. The RE may be a short conical extension or a mature root. It was found to be more common in males and on right side than in females [5]. The presence of RE noted in our patient was an infrequent finding as it was present in an Indian female in the mandibular second molar on left side.

The etiology of RE is not known. Genetic factors have been strongly implicated in its etiology. The penetrance of an atavistic gene or polygenetic system or due to external factors during odontogenesis has been attributed to RE [6,7]. The presence of RE has been attributed to certain ethnic groups as described in table 1. The prevalence is seen higher (5 - 30%) in those with mongoloid traits, such as Chinese, Eskimos and native Americans [5,8-10].

| Ethnic groups | Percentage of occurrence |
|---|---|
| Mongoloids | 40% |
| Eskimos | 27% |
| Taiwanese [Chinese] | 21.1% - 33.33% |
| Thai | 13% |
| Indians and Eurasians | < 5% |
| Europeans | 3.4 - 4.2% |
| Africans | 3% |
| Turkish | 1.9 (1st Molar) 0.6 (2nd Molar) |

***Table 1:*** *Prevalence of radix entomolaris in different ethnic groups.*

Various classifications have been used to categorise RE as follows [10]:

1. Carlsen and Alexanderson have classified RE on the basis of morphology of cervical third of RE.

| | |
|---|---|
| Type A | Distal part of the root has three cone-shaped macrostructures; lingual, medial and facial, which may be non-separate or lingual structure is separate while the medial and facial structures are non-separate. |
| Type B | Distal part of the root has two cone-shaped macrostructures, lingual and facial of nearly same size. |
| Type C | Cervical part is located mesially. |
| Type AC | Cervical part is centrally located, between mesial and distal root components. |

2. De Moor., *et al*. have described, three types of RE based on the curvature of the extra root.

| | |
|---|---|
| Type I | Straight root/root canal |
| Type II | Initially curved entrance which continues as a straight root/root canal |
| Type III | Initial curve in the coronal third of the root canal and a second curve beginning in the middle third and continuing to the apical third |

3. Wang has also classified RE depending on its identification on the periapical radiograph.

| | |
|---|---|
| Type i | Easily identified on a radiograph |
| Type ii | A large beam angulation mesially or distally, is necessary for its identification. |
| Type iii | Identification of RE is extremely difficult, because of the overlap of adjacent distobuccal root. |

In our case report, CBCT helped us to confirm the presence of radix entomolaris in mandibular left second molar and to classify it. Our case comes is classified as Type B, CBCT sagittal images confirmed the presence of Type III curvature according to De Moor classification (Figure 2). According to Wang, it was classified as type i since it was evident clearly on the radiograph. According to Carlson and Alexanderson classification, the RE was classified as type B, in which the distal part of root has two cone shaped macrostructures of nearly the same size (Figure 3).

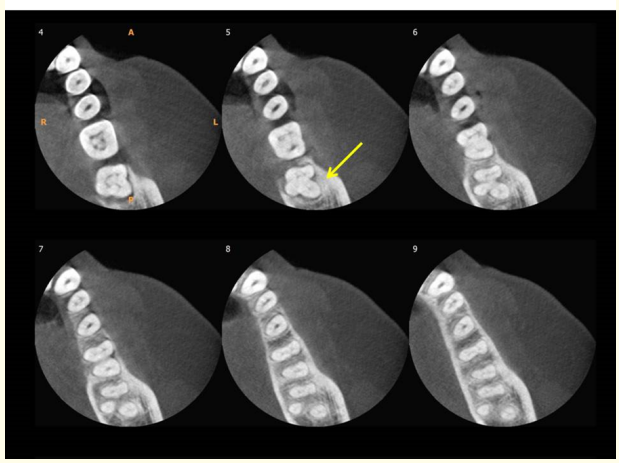

***Figure 3:*** *Axial CBCT sections show radix entomolaris in mandibular left second molar.*

## Diagnosis

It has been reported that additional root and canal can also be found in teeth with additional cusp/ tubercle (tuberculum paramolare) [11]. Thorough clinical examination may reveal the presence of extra tubercle in combination with cervical prominence and may point towards an extra root. An additional tubercle was found in 23% of the teeth with radix entomolaris in a study by Duman., *et al* [5].

An accessory root is clearly visible in most of the cases, however it may be obscured sometimes. Presence of an ill-defined outline of the distal root contour or canal may indicate the presence of RE. [12] Intraoral periapical radiograph may be supplemented with additional radiograph with a modified horizontal angulation (Clark's rule).

Advanced imaging with CBCT provides images of the area of interest in all the three dimensions. This new imaging technology helps in identification of location and pattern of canal morphology, number of canals, missed canal and calcifications along with lateral canals. In our case it was very difficult to predict the root canal anatomy on the basis of preoperative radiograph alone. Endodontic application in CBCT utilizes a small field of view with high resolution and minimal radiation exposure.

Literature reveals that majority of RE may have one or more curvatures starting in the middle third or apical third of the root. CBCT aids an in-depth understanding of the true morphology of curved root canals. CBCT images always result in the identification of a greater number of root canal systems since it allows detailed examination in all the three planes.

## Conclusion

Identification and treatment of RE is important because a missed canal remains a nidus of infection and can compromise the treatment outcome. Clinical diagnostic methods, root canal morphology and thorough examination of the pulp chamber and Conventional IOPA have been suggested. This is a case report of RE of a mandibular second molar with three roots and four canals confirmed with the help of CBCT.

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